Onsite material characterization capabilities provide quick, credible pavement data.

The FAA’s National Airport Pavement and Materials Research Center (NAPMRC) and National Airport Pavement Test Facility (NAPTF) are distinguished accelerated pavement testing (APT) facilities that develop industry guidance for durable airport pavements. This research is supported by detailed analyses of the pavement materials tested, characterizing their physical properties before, during, and after APT.

Since opening in 2010, the FAA’s NextGen Pavement Materials Laboratory has supplied advanced material characterization data through a wide range of tests. The 5,500 sq.ft. lab is equipped, and accredited, to test asphalt, concrete, soils, and aggregate materials used in airport pavement construction. It boasts a diverse array of test apparatuses, including customized equipment like an asphalt pavement analyzer built specifically for airport pavements (see reverse).

ATR technicians now perform many tests previously available only via distant, specialized labs, saving the FAA a substantial amount in testing expenses. For the past decade, the NextGen Laboratory has fulfilled its purpose, supporting the materials testing needs of the NAPTF. In coming years, though, it is predicted that industry will continue to develop longer-lasting, more sustainable airport pavement materials. The FAA’s NAPMRC will test these new asphalt mixes with support from an expanded pavements lab, the Advanced Pavement Materials Research Laboratory. The lab will not only significantly increase FAA’s testing capacity, it will also supply the capabilities needed to carry out extensive asphalt binder testing and other advanced tests.

In 2016, the NextGen Laboratory was dedicated to the memory of Jeffrey Rapol. Rapol was a devoted FAA civil engineer who was pivotal in establishing both the laboratory and the NAPTF.
In order to support industry-leading airport pavement research at ATR, the NextGen Pavement Materials Laboratory houses a broad range of specialized equipment. Airport paving materials—including asphalt, concrete, soils, and aggregates—experience punishing stresses from aircraft loads and are exposed to harsh environmental conditions such as precipitation and hot or cold temperatures over many years. Laboratory testing helps researchers to understand the impacts of these conditions on material performance in a range of scenarios.

Examples of the advanced testing methods performed by FAA within the NextGen Laboratory are below:

**Rutting** in asphalt is the accumulation of vertical deformation over time, characterized by a visible depression in an aircraft wheel path. Airport Pavement Analyzers (APAs) test rutting susceptibility of asphalt mixtures by simulating dynamic wheel loads through a pressurized hose. A standard APA’s hose pressure is 100 psi, typical of highway tire pressures, but FAA’s customized Airport Pavement Analyzer tests at 250 psi to replicate tire pressures imposed by aircraft landing gears. Research performed using this equipment has resulted in a new asphalt mixture design test standard and is integrated into FAA Standards for Specifying Airport Construction (AC 150/5370-10H).

**Fatigue** is the result of repeated stresses on a pavement material. To simulate fatigue of rigid (concrete) airfield pavements, a concrete fatigue beam apparatus applies aircraft-like bending loads to a concrete beam. Four bearing blocks hold the beam in place, creating one loading line and two support lines at equidistant points along the beam (third-point loading). Cyclic loads applied to two center blocks at a specified percentage of the sample’s breaking strength causes fatigue, and after a number of cycles, the beam suddenly ruptures. The average number of loading cycles until beam failure is an estimate of a concrete pavement slab’s fatigue life under similar loads.

Winter temperatures and aging asphalt combine to cause low-temperature cracking in asphalt pavements. Disk-shaped compact tension (DCT) is an advanced method used by the FAA to measure the ability of asphalt mixtures to resist thermal cracking. In this test, the specimen is first conditioned in an environmental chamber at a controlled temperature. Next, tension (pulling force) is applied to a notch in the sample at a constant crack mouth opening displacement rate. Sensors monitor displacement throughout the test. Resistance to fracture is measured by the fracture energy, the energy required to create a unit surface to crack.

Visit the ATR Website at [www.airporttech.tc.faa.gov](http://www.airporttech.tc.faa.gov)

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**Accurate, controlled, repeatable**

The FAA’s Airport Technology studies affect the safety and performance of airport infrastructure in the U.S. and beyond. Therefore, it is imperative that industry standards are recognized and employed during the research process. For this important task, ATR’s airport pavement research program relies on the NextGen Pavement Materials Laboratory to control quality and substantiate its scientific findings.

Since 2013, the NextGen Laboratory has been a member of the American Association of State Highway and Transportation Officials (AASHTO) Accreditation Program (AAP) and an established Cement and Concrete Reference Laboratory (CCRL). The lab is accredited for over 50 standards, including protocols for asphalt, concrete, soil, and aggregates—a process which includes inspection of each certified standard and of the lab’s quality management systems. Additionally, participation in AASHTO’s sample proficiency program is required in order to monitor lab practices and equipment for quality control. Test results are submitted to the program on a regular basis to confirm accuracy.

Together, all of these efforts provide the necessary tools for high-quality and proficient onsite testing that continues to increase the efficacy of the FAA’s airport pavement research program.